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The Effects of Urban Stream Restoration on Shrinking Cities

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The term "stream restoration" broadly describes stream and river management practices that add ecosystem value to a stream and return it to a more "natural" condition (ASCE, 2003; Landers, 2010). According to the Natural Resources Conservation Service, restoration seeks to reestablish the "general structure; function; and dynamic, but self-sustaining, behavior of the ecosystem" (USDA NRCS, 2007). To achieve these lofty goals, a variety or river restoration techniques can be employed; the appropriate technique varies greatly depending on the scope and goals of the project. Stream restoration projects vary in scale from planting vegetation along the stream banks to modifying stream habitat to changing the flow path of the stream, or even "daylighting" channels by uncovering a section of stream that had been previously forced underground (i.e. Landers, 2010; Landers, 2008; Moran, 2007). These types of restoration projects are becoming more common in urban areas, because restoring streams is one way to "green" a city and convert channelized, concrete and rip-rap lined rivers to naturalized, beautiful aquatic and riparian habitats, which often include river-front parks and other community amenities that attract people to the area (Shoredits and Clayton, 2013; Landers, 2010). While stream restoration is widely viewed as beneficial, each project heralds large changes to both the stream and the city and may result in negative, unintended, or unforeseen consequences. Stream restoration is a rapidly growing and changing field in both the academic and public sectors, but only about 10% of restoration projects have been subject to monitoring and analysis following their completion (Landers, 2010; Haren, 2011). Furthermore, most of the projects that actually

have been analyzed for success have only been viewed in the context of ecological or hydrologic function, without consideration of the social component of the project, even though many stream restoration guidelines and motivations stress the importance of community involvement in and acceptance of the project (Shoredits, 2013; Moran, 2007; ASCE, 2003). Without assessment of restoration projects, it is difficult to judge the success or failure of the endeavor or determine the actual versus expected impacts of the restoration on the stream channel and the surrounding community. Here, I explore some of these impacts through the context of urban stream restoration in the shrinking city.

Urban stream restoration projects often involve the creation of parks and walking trails alongside restored streams and the improve habitat conditions both in the stream and along the floodplains. This creation of green space encourages recreation and better health and provides a restorative environment that can foster increased productivity, reduced stress levels, and better moods (Matsuoka and Sullivan, 2011). Green space in also important in cities because it increases biodiversity, allows for carbon sequestration, improves air quality, filters stormwater, and generally increase the "wildness" of a city, which can have both positive and negative impacts in a city. A study by Bae (2011) examined the value of three different urban stream scenarios: one a concrete-encased stream, the second a "natural state" stream that had been restored but did not include any recreational areas (just a floodplain), and the third a restored, "natural state", stream with walkways and other recreational facilities. He found that the restored stream without recreational areas had a value of about 50 USD per household over the concrete-encased stream, while the stream with recreational areas is valued at about 75 USD per household (Bae, 2011). This shows that stream restoration is valuable even without the added value of recreational facilities, but that the use of the stream by the community is very important

to increasing the value of the area even more, so this aspect of stream restoration should not be ignored.

Tied into the idea that stream restoration adds both monetary value and the less tangible values mentioned above is the fact that property values increase following stream restoration projects. One of the most important issues that arises because of this is the conflict between urban regeneration and gentrification. Lim et al. studied this issue in Seoul, Korea in the wake of the Cheonggye Stream Restoration Project that took place on 5.8 km of river in Seoul's central business district. The restoration project spurred redevelopment of much of the city surrounding the stream corridor, bringing in new businesses while pushing some of the existing businesses into other parts of the city or putting them out of business altogether (Lim et al., 2013). The flurry of redevelopment activity that occurred in response to the stream restoration project is illustrated in Figure 1, below. While the old business that had been located along the stream were generally more industrial spaces, many of the new uses are for office spaces or commercial pursuits like cafes and restaurants, which are termed "higher uses". In this case, the "lower uses" experienced "commercial gentrification" and the new facilities catered towards more affluent owners and users, as rents increased (Lim et al., 2013). The authors concluded that "while both gentrification and urban regeneration conceptualize the same phenomenon, the former pays attention to the losers and the latter to the winners." (Lim et al., 2013).

Using the term gentrification denotes that an environmental injustice has occurred because of the stream restoration. It has been shown in many literature studies that minority and low-income groups tend to have limited access to green space, while the wealthy have greater access and thus reap the ecosystem and health benefits associated with green space (Wolch et al., 2014; Lim et al., 2013). This disparity exists due to a multitude of reasons, including (but not

limited to) the history of the city's development, park design philosophy, and ethno-racial inequality (Wolch et al., 2014). To attempt to address the environmental injustice that results from a lack of green space, parks have been developed in park-poor communities, but these parks can actually compound the problem. The new park increases the attractiveness of a neighborhood, bringing people into the community and at the same time, increasing property values and housing costs. This can force the original residents out of the area and into another neighborhood with lower housing costs, and likely no parks (Wolch et al., 2014). The same is true of stream restoration projects and the parks developed in conjunction with these projects, as was demonstrated in the Seoul case study discussed above.

To encourage stream restoration without gentrification, Wolch et al. suggest making a city or restoration project "just green enough" (2014). This is an abstract idea that may be difficult to put into practice, as Wolch notes that even the smallest addition of green space can increase property values and lead to displacement of lower-income residents. However, Wolch and his fellow authors (2014) suggest working intimately with the community to develop a restoration strategy that is "explicitly shaped by community concerns, needs, and desires" as opposed to purely ecological drivers. This can allow for the creation of green space that is more closely connected to community needs and concerns, which will increase the ownership residents feel for the area and strengthen their resolve to stay, even if property values do rise. Wolch claims that the "just green enough" strategy is a good opportunity to create spaces for urban agriculture or community gardens, which provide ecosystem services and can address community concerns over food security (Wolch et al., 2014). Stream restoration projects following the "just green enough" principles could be focused on creating in-stream fish habitat and providing clean water for aquatic health, giving locals both recreational opportunities and a

supplemental food source (provided the fish are not contaminated with mercury or other pollutants). The "just green enough" restored stream corridor could potentially have walking paths that lead to more commercial areas or to work areas, depending on the layout of the city, and the restored banks could be used for community gardens. Figure 2 shows green space retrofits in Hangzhou, China, where residents can grow their own food (Wolch et al., 2014). Although this picture is next to a railroad, similar spaces exist along canals in the city, and these canals could be restored to allow them to periodically flood into the gardens, providing them with water and nutrients from the river. However, as has been demonstrated in many urban projects, if the community is not involved enough in the planning and development of the stream restoration project, it will likely fail to bring the community together and prevent gentrification, thus contributing to the paradox of urban regeneration efforts and becoming another instance of environmental injustice.

Urban stream restoration does not always result in gentrification, however, even if the entire community is not intimately involved in the restoration process. In some cases, like that of Baxter Creek in El Cerrito, California, it seems possible for urban regeneration to occur without the negative effects of gentrification. This conclusion is approached with skepticism, however, because the community dynamics were not fully described in the study (Purcell et al., 2002). The before and after images associated with the project show an area of small, densely clustered houses rather than the high-rise apartments one may associate with city communities (see Figure 3). Additionally, no information about the resident's incomes was provided, so it is difficult to determine if the restoration was completed in an area where lower-income residents could potentially be displaced by the restoration efforts. This example illustrates the wide range of urban settings within which urban stream restoration is occurring and how the type of

community may influence how they react to the restoration. In this case, a survey was used to gain insight into the views and opinions of the residents of the area surrounding the park and stream restoration site. The residents that had been involved in the planning process (about 37 percent of survey respondents) mostly had favorable views of the restoration and responded to the project by refurbishing a playground located in the same park as the creek (Purcell et al., 2002). Thus, one restoration led to another, which could be viewed as the beginnings of urban regeneration. There were some negative concerns raised in relation to the stream restoration project, however. These included concern over the reduced visibility due to the abundant riparian vegetation (see Figure 3) and the fear that this might conceal crime (Purcell et al., 2002). It is interesting to note, however, that some of the residents had participated in a survey just after restoration was completed and many said that they did not like the way the stream looked because the vegetation had not yet been fully established (Purcell et al., 2002). Perhaps increased communication with the community about the timeline of the restoration would have reduced the number of unhappy residents after the project was first completed. Another concern residents had regarding the newly daylighted stream was a fear that it would be unhealthy for them, attract mosquitoes, and carry water-borne diseases. Here the author notes that increased outreach and education at the beginning of the restoration project would have reduced these fears and increased the acceptance and overall success of the project (Purcell et al., 2002). Only 29 of the 45 survey respondents claimed that they were told about the project before it began, so awareness in the community seems to be fairly low (Purcell et al., 2002). The low survey participation rate also indicates low community involvement for many of the local residents, which may impact the overall success of the project and could lead to doubts about the ability of the survey respondents to accurately represent the entire community of park and stream users.

More focused research would have to be done at this site in order to determine if the stream restoration project and the associated greening of the park impacted who lived in the area and who moved into or out of the area based on housing costs. This study ultimately shows that involving the community in the planning process and educating residents about the stream restoration is important to the overall success of the project.

Stream restoration is a boon to the community surrounding the restored stream because of the ecosystem services offered by the stream and its riparian and floodplain communities and because of the parks and walkways that are often established in conjunction with the restoration of the stream. However, it is evident that stream restoration, like the establishment of many other green spaces in urban environments, can contribute to environmental injustice in the form of gentrification. Gentrification occurs because green space in a place where there previously was none increases the property value of an area, thus increasing the costs of owning that land. The ecosystem and health benefits that living and working near green spaces offer attracts more people to the area, which is very good for commercial businesses, but not as good for people who cannot afford to pay their new, higher rent and are therefore forced to leave. The intention is to spark urban regeneration, but often these plans are undermined by the natural flux in land prices, as was seen in the Seoul, Korea example, where industrial users were forced to move to make way for commercial users. The Baxter Creek example (Purcell et al., 2002) discussed above shows that gentrification doesn't always occur as a result of stream restoration, but there is not enough evidence to show why this didn't occur in the El Cerrito community. Perhaps it was due to some level of community involvement in the project, or perhaps it was because of the type of community. Each stream restoration case is different, due to differences in the type of stream, the community structure, and the city structure, amongst other variables. Wolch et al. encourages

proponents of stream restoration projects to connect with the community and make them an integral part of the restoration, in an effort to avoid gentrification (2014). The authors propose the idea of "just green enough", meaning that the restoration project should be tailored towards the individual needs of the community rather than be a grand design focused on ecosystem function first (Wolch et al., 2014). This approach would likely reduce the cost of a project and more importantly, it would increase the overall success of the project, because the community would feel a sense of ownership and connectedness with the restored stream. It has been demonstrated in many papers, including the Baxter Creek study, that community awareness and involvement is key to success. While it is important to look to other projects for inspiration, in the future, stream restoration projects should be unique to the site and to the needs of the stream and community stakeholders. This will encourage success and reduce environmental injustices such as gentrification.

Figures

Figure 1: A visual representation of the changes that occurred immediately following the Cheonggye Stream Restoration Project in Seoul, Korea. The river is in the center of the map, with the city on either side. The symbols show permits issued for redevelopment, new buildings, renovations, and use changes over a six year period, following the stream restoration project. There are many more permits represented here than were given in the time before the stream restoration project began, illustrating the stimulus the project had on the area. (Lim et al., 2013)

Figure 2: Gardens created in previously unused space in Hangzhou, China. This is an example of a project that is "just green enough" and is not expected to cause gentrification (Wolch et al., 2014). This idea could be recreated along an urban stream, which could be restored to provide water and nutrients to the cultivated area in the floodplain.

Figure 3: Images of the Baxter Creek stream restoration site during and after the restoration (taken two years apart) (Purcell et al., 2002). This image provides limited information about the community in which the stream restoration was completed, but it is more than is described in the journal article.

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